$b\overline{b}$ MESONS

NODE=MXXX030

$\Upsilon(1S)$

$I^G(J^{PC}) = 0^-(1^{--})$

NODE=M049

Mass $m = 9460.30 \pm 0.26$ MeV (S = 3.3)
Full width $\Gamma = 54.02 \pm 1.25$ keV
$\Gamma_{ee} = 1.340 \pm 0.018$ keV

NODE=M049M;DTYPE=M
NODE=M049W;DTYPE=G;OUR EVAL; → UNCHECKED ←
NODE=M049W2;DTYPE=E;OUR EVAL; → UNCHECKED ←

$\Upsilon(1S)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)	
$\tau^+\tau^-$	(2.60 ± 0.10) %		4384	NODE=M049215;DESIG=3
e^+e^-	(2.38 ± 0.11) %		4730	DESIG=2
$\mu^+\mu^-$	(2.48 ± 0.05) %		4729	DESIG=1
Hadronic decays				NODE=M049;CLUMP=A
ggg	(81.7 ± 0.7) %		–	DESIG=117
γgg	(2.2 ± 0.6) %		–	DESIG=118
$\eta'(958)$ anything	(2.94 ± 0.24) %		–	DESIG=73
$J/\psi(1S)$ anything	$(6.5 \pm 0.7) \times 10^{-4}$		4223	DESIG=12
χ_{c0} anything	$< 5 \times 10^{-3}$	90%	–	DESIG=5
χ_{c1} anything	$(2.3 \pm 0.7) \times 10^{-4}$		–	DESIG=6
χ_{c2} anything	$(3.4 \pm 1.0) \times 10^{-4}$		–	DESIG=7
$\psi(2S)$ anything	$(2.7 \pm 0.9) \times 10^{-4}$		–	DESIG=8
$\rho\pi$	$< 2 \times 10^{-4}$	90%	4697	DESIG=11
$\pi^+\pi^-$	$< 5 \times 10^{-4}$	90%	4728	DESIG=23
K^+K^-	$< 5 \times 10^{-4}$	90%	4704	DESIG=24
$p\overline{p}$	$< 5 \times 10^{-4}$	90%	4636	DESIG=25
$\pi^0\pi^+\pi^-$	$< 1.84 \times 10^{-5}$	90%	4725	DESIG=72
$D^*(2010)^\pm$ anything	(2.52 ± 0.20) %		–	DESIG=30
$\overline{d}$ anything	$(2.86 \pm 0.28) \times 10^{-5}$		–	DESIG=107
Sum of 100 exclusive modes	(1.200 ± 0.017) %		–	DESIG=128
Radiative decays				NODE=M049;CLUMP=B
$\gamma\pi^+\pi^-$	$(6.3 \pm 1.8) \times 10^{-5}$		4728	DESIG=70
$\gamma\pi^0\pi^0$	$(1.7 \pm 0.7) \times 10^{-5}$		4728	DESIG=71
$\gamma\pi^0\eta$	$< 2.4 \times 10^{-6}$	90%	4713	DESIG=111
γK^+K^-	[a] $(1.14 \pm 0.13) \times 10^{-5}$		4704	DESIG=102
$\gamma p\overline{p}$	[b] $< 6 \times 10^{-6}$	90%	4636	DESIG=103
$\gamma 2h^+2h^-$	$(7.0 \pm 1.5) \times 10^{-4}$		4720	DESIG=20
$\gamma 3h^+3h^-$	$(5.4 \pm 2.0) \times 10^{-4}$		4703	DESIG=21
$\gamma 4h^+4h^-$	$(7.4 \pm 3.5) \times 10^{-4}$		4679	DESIG=22
$\gamma\pi^+\pi^-K^+K^-$	$(2.9 \pm 0.9) \times 10^{-4}$		4686	DESIG=14
$\gamma 2\pi^+2\pi^-$	$(2.5 \pm 0.9) \times 10^{-4}$		4720	DESIG=13
$\gamma 3\pi^+3\pi^-$	$(2.5 \pm 1.2) \times 10^{-4}$		4703	DESIG=17
$\gamma 2\pi^+2\pi^-K^+K^-$	$(2.4 \pm 1.2) \times 10^{-4}$		4658	DESIG=18
$\gamma\pi^+\pi^-p\overline{p}$	$(1.5 \pm 0.6) \times 10^{-4}$		4604	DESIG=15
$\gamma 2\pi^+2\pi^-p\overline{p}$	$(4 \pm 6) \times 10^{-5}$		4563	DESIG=19
$\gamma 2K^+2K^-$	$(2.0 \pm 2.0) \times 10^{-5}$		4601	DESIG=16
$\gamma\eta'(958)$	$< 1.9 \times 10^{-6}$	90%	4682	DESIG=55
$\gamma\eta$	$< 1.0 \times 10^{-6}$	90%	4714	DESIG=54
$\gamma f_0(980)$	$< 3 \times 10^{-5}$	90%	4678	DESIG=105
$\gamma f'_2(1525)$	$(3.8 \pm 0.9) \times 10^{-5}$		4607	DESIG=52
$\gamma f_2(1270)$	$(1.01 \pm 0.09) \times 10^{-4}$		4644	DESIG=51
$\gamma\eta(1405)$	$< 8.2 \times 10^{-5}$	90%	4625	DESIG=65
$\gamma f_0(1500)$	$< 1.5 \times 10^{-5}$	90%	4610	DESIG=108
$\gamma f_0(1710)$	$< 2.6 \times 10^{-4}$	90%	4574	DESIG=53
$\gamma f_0(1710) \rightarrow \gamma K^+K^-$	$< 7 \times 10^{-6}$	90%	–	DESIG=112

$\gamma f_0(1710) \rightarrow \gamma\pi^0\pi^0$		$<$ 1.4	$\times 10^{-6}$	90%	–	DESIG=109
$\gamma f_0(1710) \rightarrow \gamma\eta\eta$		$<$ 1.8	$\times 10^{-6}$	90%	–	DESIG=110
$\gamma f_4(2050)$		$<$ 5.3	$\times 10^{-5}$	90%	4515	DESIG=104
$\gamma f_0(2200) \rightarrow \gamma K^+K^-$		$<$ 2	$\times 10^{-4}$	90%	4475	DESIG=69
$\gamma f_J(2220) \rightarrow \gamma K^+K^-$		$<$ 8	$\times 10^{-7}$	90%	4469	DESIG=60
$\gamma f_J(2220) \rightarrow \gamma\pi^+\pi^-$		$<$ 6	$\times 10^{-7}$	90%	–	DESIG=61
$\gamma f_J(2220) \rightarrow \gamma p\overline{p}$		$<$ 1.1	$\times 10^{-6}$	90%	–	DESIG=62
$\gamma\eta(2225) \rightarrow \gamma\phi\phi$		$<$ 3	$\times 10^{-3}$	90%	4469	DESIG=68
$\gamma\eta_c(1S)$		$<$ 5.7	$\times 10^{-5}$	90%	4260	DESIG=119
$\gamma\chi_{c0}$		$<$ 6.5	$\times 10^{-4}$	90%	4114	DESIG=120
$\gamma\chi_{c1}$		$<$ 2.3	$\times 10^{-5}$	90%	4079	DESIG=121
$\gamma\chi_{c2}$		$<$ 7.6	$\times 10^{-6}$	90%	4062	DESIG=122
$\gamma X(3872) \rightarrow \pi^+\pi^- J/\psi$		$<$ 1.6	$\times 10^{-6}$	90%	–	DESIG=123
$\gamma X(3872) \rightarrow \pi^+\pi^-\pi^0 J/\psi$		$<$ 2.8	$\times 10^{-6}$	90%	–	DESIG=124
$\gamma X(3915) \rightarrow \omega J/\psi$		$<$ 3.0	$\times 10^{-6}$	90%	–	DESIG=125
$\gamma X(4140) \rightarrow \phi J/\psi$		$<$ 2.2	$\times 10^{-6}$	90%	–	DESIG=126
γX	[c]	$<$ 4.5	$\times 10^{-6}$	90%	–	DESIG=66
$\gamma X\overline{X}(m_X < 3.1$ GeV)	[d]	$<$ 1	$\times 10^{-3}$	90%	–	DESIG=67
$\gamma X\overline{X}(m_X < 4.5$ GeV)	[e]	$<$ 2.4	$\times 10^{-4}$	90%	–	DESIG=127
$\gamma X \rightarrow \gamma + \geq 4$ prongs	[f]	$<$ 1.78	$\times 10^{-4}$	95%	–	DESIG=113
$\gamma a_1^0 \rightarrow \gamma\mu^+\mu^-$	[g]	$<$ 9	$\times 10^{-6}$	90%	–	DESIG=114
$\gamma a_1^0 \rightarrow \gamma\tau^+\tau^-$	[a]	$<$ 5.0	$\times 10^{-5}$	90%	–	DESIG=115
Lepton Family number (*LF*) violating modes						NODE=M049;CLUMP=C
$\mu^\pm\tau^\mp$	*LF*	$<$ 6.0	$\times 10^{-6}$	95%	4563	DESIG=116
Other decays						NODE=M049;CLUMP=D
invisible		$<$ 3.0	$\times 10^{-4}$	90%	–	DESIG=106

$\chi_{b0}(1P)$ [h]

$I^G(J^{PC}) = 0^+(0^{++})$
J needs confirmation. NODE=M076

Mass $m = 9859.44 \pm 0.42 \pm 0.31$ MeV NODE=M076M;DTYPE=M;OUR EVAL; → UNCHECKED ←

$\chi_{b0}(1P)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)	
$\gamma\Upsilon(1S)$	(1.76±0.35) %		391	NODE=M076215;DESIG=1
D^0X	$<$ 10.4 %	90%	–	DESIG=2
$\pi^+\pi^-K^+K^-\pi^0$	$<$ 1.6 $\times 10^{-4}$	90%	4875	DESIG=3
$2\pi^+\pi^-K^-K^0_S$	$<$ 5 $\times 10^{-5}$	90%	4875	DESIG=4
$2\pi^+\pi^-K^-K^0_S 2\pi^0$	$<$ 5 $\times 10^{-4}$	90%	4846	DESIG=5
$2\pi^+2\pi^-2\pi^0$	$<$ 2.1 $\times 10^{-4}$	90%	4905	DESIG=6
$2\pi^+2\pi^-K^+K^-$	(1.1 ±0.6) $\times 10^{-4}$		4861	DESIG=7
$2\pi^+2\pi^-K^+K^-\pi^0$	$<$ 2.7 $\times 10^{-4}$	90%	4846	DESIG=8
$2\pi^+2\pi^-K^+K^-2\pi^0$	$<$ 5 $\times 10^{-4}$	90%	4828	DESIG=9
$3\pi^+2\pi^-K^-K^0_S\pi^0$	$<$ 1.6 $\times 10^{-4}$	90%	4827	DESIG=10
$3\pi^+3\pi^-$	$<$ 8 $\times 10^{-5}$	90%	4904	DESIG=11
$3\pi^+3\pi^-2\pi^0$	$<$ 6 $\times 10^{-4}$	90%	4881	DESIG=12
$3\pi^+3\pi^-K^+K^-$	(2.4 ±1.2) $\times 10^{-4}$		4827	DESIG=13
$3\pi^+3\pi^-K^+K^-\pi^0$	$<$ 1.0 $\times 10^{-3}$	90%	4808	DESIG=14
$4\pi^+4\pi^-$	$<$ 8 $\times 10^{-5}$	90%	4880	DESIG=15
$4\pi^+4\pi^-2\pi^0$	$<$ 2.1 $\times 10^{-3}$	90%	4850	DESIG=16

$\chi_{b1}(1P)$ [h]

$I^G(J^{PC}) = 0^+(1^{++})$
J needs confirmation. NODE=M077

Mass $m = 9892.78 \pm 0.26 \pm 0.31$ MeV NODE=M077M;DTYPE=M;OUR EVAL; → UNCHECKED ←

$\chi_{b1}(1P)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)	
$\gamma\,\Upsilon(1S)$	(33.9 ± 2.2) %		423	NODE=M077215;DESIG=1
$D^0 X$	(12.6 ± 2.2) %		–	DESIG=2
$\pi^+\pi^-K^+K^-\pi^0$	$(2.0\pm0.6)\times10^{-4}$		4892	DESIG=3
$2\pi^+\pi^-K^-K^0_S$	$(1.3\pm0.5)\times10^{-4}$		4892	DESIG=4
$2\pi^+\pi^-K^-K^0_S2\pi^0$	$<6\times10^{-4}$	90%	4863	DESIG=5
$2\pi^+2\pi^-2\pi^0$	$(8.0\pm2.5)\times10^{-4}$		4921	DESIG=6
$2\pi^+2\pi^-K^+K^-$	$(1.5\pm0.5)\times10^{-4}$		4878	DESIG=7
$2\pi^+2\pi^-K^+K^-\pi^0$	$(3.5\pm1.2)\times10^{-4}$		4863	DESIG=8
$2\pi^+2\pi^-K^+K^-2\pi^0$	$(8.6\pm3.2)\times10^{-4}$		4845	DESIG=9
$3\pi^+2\pi^-K^-K^0_S\pi^0$	$(9.3\pm3.3)\times10^{-4}$		4844	DESIG=10
$3\pi^+3\pi^-$	$(1.9\pm0.6)\times10^{-4}$		4921	DESIG=11
$3\pi^+3\pi^-2\pi^0$	$(1.7\pm0.5)\times10^{-3}$		4898	DESIG=12
$3\pi^+3\pi^-K^+K^-$	$(2.6\pm0.8)\times10^{-4}$		4844	DESIG=13
$3\pi^+3\pi^-K^+K^-\pi^0$	$(7.5\pm2.6)\times10^{-4}$		4825	DESIG=14
$4\pi^+4\pi^-$	$(2.6\pm0.9)\times10^{-4}$		4897	DESIG=15
$4\pi^+4\pi^-2\pi^0$	$(1.4\pm0.6)\times10^{-3}$		4867	DESIG=16

$h_b(1P)$

$I^G(J^{PC}) = ?^?(1^{+-})$

NODE=M204

Mass $m = 9899.3 \pm 1.0$ MeV

NODE=M204M;DTYPE=M

$h_b(1P)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)	
$\eta_b(1S)\gamma$	(49^{+8}_{-7}) %	489	NODE=M204215;DESIG=1

$\chi_{b2}(1P)$ [h]

$I^G(J^{PC}) = 0^+(2^{++})$
J needs confirmation.

NODE=M078

Mass $m = 9912.21 \pm 0.26 \pm 0.31$ MeV

NODE=M078M;DTYPE=M;OUR EVAL; → UNCHECKED ←

$\chi_{b2}(1P)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)	
$\gamma\,\Upsilon(1S)$	(19.1 ± 1.2) %		442	NODE=M078215;DESIG=1
$D^0 X$	<7.9 %	90%	–	DESIG=2
$\pi^+\pi^-K^+K^-\pi^0$	$(8\pm5)\times10^{-5}$		4902	DESIG=3
$2\pi^+\pi^-K^-K^0_S$	$<1.0\times10^{-4}$	90%	4901	DESIG=4
$2\pi^+\pi^-K^-K^0_S2\pi^0$	$(5.3\pm2.4)\times10^{-4}$		4873	DESIG=5
$2\pi^+2\pi^-2\pi^0$	$(3.5\pm1.4)\times10^{-4}$		4931	DESIG=6
$2\pi^+2\pi^-K^+K^-$	$(1.1\pm0.4)\times10^{-4}$		4888	DESIG=7
$2\pi^+2\pi^-K^+K^-\pi^0$	$(2.1\pm0.9)\times10^{-4}$		4872	DESIG=8
$2\pi^+2\pi^-K^+K^-2\pi^0$	$(3.9\pm1.8)\times10^{-4}$		4855	DESIG=9
$3\pi^+2\pi^-K^-K^0_S\pi^0$	$<5\times10^{-4}$	90%	4854	DESIG=10
$3\pi^+3\pi^-$	$(7.0\pm3.1)\times10^{-5}$		4931	DESIG=11
$3\pi^+3\pi^-2\pi^0$	$(1.0\pm0.4)\times10^{-3}$		4908	DESIG=12
$3\pi^+3\pi^-K^+K^-$	$<8\times10^{-5}$	90%	4854	DESIG=13
$3\pi^+3\pi^-K^+K^-\pi^0$	$(3.6\pm1.5)\times10^{-4}$		4835	DESIG=14
$4\pi^+4\pi^-$	$(8\pm4)\times10^{-5}$		4907	DESIG=15
$4\pi^+4\pi^-2\pi^0$	$(1.8\pm0.7)\times10^{-3}$		4877	DESIG=16

$\Upsilon(2S)$

$I^G(J^{PC}) = 0^-(1^{--})$

NODE=M052

Mass $m = 10023.26 \pm 0.31$ MeV

NODE=M052M;DTYPE=M

$m_{\Upsilon(3S)} - m_{\Upsilon(2S)} = 331.50 \pm 0.13$ MeV

NODE=M052DM3;DTYPE=D

Full width $\Gamma = 31.98 \pm 2.63$ keV

NODE=M052W;DTYPE=G;OUR EVAL; → UNCHECKED ←

$\Gamma_{ee} = 0.612 \pm 0.011$ keV

NODE=M052W2;DTYPE=E;OUR EVAL; → UNCHECKED ←

$\Upsilon(2S)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)	
$\Upsilon(1S)\pi^+\pi^-$	(17.85 ± 0.26) %		475	NODE=M052215;DESIG=4
$\Upsilon(1S)\pi^0\pi^0$	(8.6 ± 0.4) %		480	DESIG=5
$\tau^+\tau^-$	(2.00 ± 0.21) %		4686	DESIG=3
$\mu^+\mu^-$	(1.93 ± 0.17) %	S=2.2	5011	DESIG=1
e^+e^-	(1.91 ± 0.16) %		5012	DESIG=2
$\Upsilon(1S)\pi^0$	$< 4 \times 10^{-5}$	CL=90%	531	DESIG=10
$\Upsilon(1S)\eta$	$(2.9 \pm 0.4) \times 10^{-4}$	S=2.0	126	DESIG=6
$J/\psi(1S)$ anything	$< 6 \times 10^{-3}$	CL=90%	4533	DESIG=20
$\overline{d}$ anything	$(3.4 \pm 0.6) \times 10^{-5}$		–	DESIG=16
hadrons	(94 ±11) %		–	DESIG=101
ggg	(58.8 ± 1.2) %		–	DESIG=105
γgg	(8.8 ± 1.1) %		–	DESIG=106
Sum of 100 exclusive modes	$(2.90 \pm 0.30) \times 10^{-3}$		–	DESIG=121
Radiative decays				NODE=M052;CLUMP=A
$\gamma\chi_{b1}(1P)$	(6.9 ± 0.4) %		130	DESIG=8
$\gamma\chi_{b2}(1P)$	(7.15 ± 0.35) %		110	DESIG=7
$\gamma\chi_{b0}(1P)$	(3.8 ± 0.4) %		162	DESIG=9
$\gamma f_0(1710)$	$< 5.9 \times 10^{-4}$	CL=90%	4864	DESIG=13
$\gamma f'_2(1525)$	$< 5.3 \times 10^{-4}$	CL=90%	4896	DESIG=12
$\gamma f_2(1270)$	$< 2.41 \times 10^{-4}$	CL=90%	4931	DESIG=11
$\gamma\eta_c(1S)$	$< 2.7 \times 10^{-5}$	CL=90%	4568	DESIG=111
$\gamma\chi_{c0}$	$< 1.0 \times 10^{-4}$	CL=90%	4430	DESIG=112
$\gamma\chi_{c1}$	$< 3.6 \times 10^{-6}$	CL=90%	4397	DESIG=113
$\gamma\chi_{c2}$	$< 1.5 \times 10^{-5}$	CL=90%	4381	DESIG=114
$\gamma X(3872) \to \pi^+\pi^- J/\psi$	$< 8 \times 10^{-7}$	CL=90%	–	DESIG=115
$\gamma X(3872) \to \pi^+\pi^-\pi^0 J/\psi$	$< 2.4 \times 10^{-6}$	CL=90%	–	DESIG=116
$\gamma X(3915) \to \omega J/\psi$	$< 2.8 \times 10^{-6}$	CL=90%	–	DESIG=117
$\gamma X(4140) \to \phi J/\psi$	$< 1.2 \times 10^{-6}$	CL=90%	–	DESIG=118
$\gamma X(4350) \to \phi J/\psi$	$< 1.3 \times 10^{-6}$	CL=90%	–	DESIG=119
$\gamma\eta_b(1S)$	$(3.9 \pm 1.5) \times 10^{-4}$		606	DESIG=102
$\gamma X \to \gamma + \geq 4$ prongs [i]	$< 1.95 \times 10^{-4}$	CL=95%	–	DESIG=103
$\gamma A^0 \to \gamma$ hadrons	$< 8 \times 10^{-5}$	CL=90%	–	DESIG=108
$\gamma a_1^0 \to \gamma\mu^+\mu^-$	$< 8.3 \times 10^{-6}$	CL=90%	–	DESIG=123
Lepton Family number (*LF*) violating modes				NODE=M052;CLUMP=B
$e^\pm\tau^\mp$ *LF*	$< 3.2 \times 10^{-6}$	CL=90%	4854	DESIG=107
$\mu^\pm\tau^\mp$ *LF*	$< 3.3 \times 10^{-6}$	CL=90%	4854	DESIG=104

$\Upsilon(1D)$

$I^G(J^{PC}) = 0^-(2^{--})$

NODE=M177

Mass $m = 10163.7 \pm 1.4$ MeV (S = 1.7)

NODE=M177M;DTYPE=M

$\Upsilon(1D)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)	
$\gamma\gamma\Upsilon(1S)$	seen	679	NODE=M177215;DESIG=1;OUR EVAL; → UNCHECKED ←
$\gamma\chi_{bJ}(1P)$	seen	300	DESIG=2;OUR EVAL;→ UNCHECKED ←
$\eta\Upsilon(1S)$	not seen	426	DESIG=3;OUR EVAL;→ UNCHECKED ←
$\pi^+\pi^-\Upsilon(1S)$	$(6.6 \pm 1.6) \times 10^{-3}$	623	DESIG=4

$\chi_{b0}(2P)$ [h]

$I^G(J^{PC}) = 0^+(0^{++})$
J needs confirmation.

NODE=M079

Mass $m = 10232.5 \pm 0.4 \pm 0.5$ MeV

NODE=M079M;DTYPE=M;OUR EVAL; → UNCHECKED ←

$\chi_{b0}(2P)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)	
$\gamma\,\Upsilon(2S)$	(4.6 ± 2.1) %		207	NODE=M079215;DESIG=2
$\gamma\,\Upsilon(1S)$	$(9\ \pm6\ )\times10^{-3}$		743	DESIG=1
$D^0\,X$	<8.2 %	90%	–	DESIG=3
$\pi^+\pi^-K^+K^-\pi^0$	$<3.4\times10^{-5}$	90%	5064	DESIG=4
$2\pi^+\pi^-K^-K^0_S$	$<5\times10^{-5}$	90%	5063	DESIG=5
$2\pi^+\pi^-K^-K^0_S2\pi^0$	$<2.2\times10^{-4}$	90%	5036	DESIG=6
$2\pi^+2\pi^-2\pi^0$	$<2.4\times10^{-4}$	90%	5092	DESIG=7
$2\pi^+2\pi^-K^+K^-$	$<1.5\times10^{-4}$	90%	5050	DESIG=8
$2\pi^+2\pi^-K^+K^-\pi^0$	$<2.2\times10^{-4}$	90%	5035	DESIG=9
$2\pi^+2\pi^-K^+K^-2\pi^0$	$<1.1\times10^{-3}$	90%	5019	DESIG=10
$3\pi^+2\pi^-K^-K^0_S\pi^0$	$<7\times10^{-4}$	90%	5018	DESIG=11
$3\pi^+3\pi^-$	$<7\times10^{-5}$	90%	5091	DESIG=12
$3\pi^+3\pi^-2\pi^0$	$<1.2\times10^{-3}$	90%	5070	DESIG=13
$3\pi^+3\pi^-K^+K^-$	$<1.5\times10^{-4}$	90%	5017	DESIG=14
$3\pi^+3\pi^-K^+K^-\pi^0$	$<7\times10^{-4}$	90%	4999	DESIG=15
$4\pi^+4\pi^-$	$<1.7\times10^{-4}$	90%	5069	DESIG=16
$4\pi^+4\pi^-2\pi^0$	$<6\times10^{-4}$	90%	5039	DESIG=17

$\chi_{b1}(2P)$ [h]

$I^G(J^{PC}) = 0^+(1^{++})$
J needs confirmation. NODE=M080

Mass $m = 10255.46 \pm 0.22 \pm 0.50$ MeV NODE=M080M;DTYPE=M;OUR EVAL; → UNCHECKED ←
$m_{\chi_{b1}(2P)} - m_{\chi_{b0}(2P)} = 23.5 \pm 1.0$ MeV NODE=M080M2;DTYPE=D

$\chi_{b1}(2P)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor	p (MeV/c)	
$\omega\,\Upsilon(1S)$	$(1.63^{+0.40}_{-0.34})$ %		135	NODE=M080215;DESIG=3
$\gamma\,\Upsilon(2S)$	$(19.9\ \pm1.9\ )$ %		230	DESIG=2
$\gamma\,\Upsilon(1S)$	$(9.2\ \pm0.8\ )$ %	1.1	764	DESIG=1
$\pi\pi\chi_{b1}(1P)$	$(9.1\ \pm1.3\ )\times10^{-3}$		238	DESIG=4
$D^0\,X$	$(8.8\ \pm1.7\ )$ %		–	DESIG=5
$\pi^+\pi^-K^+K^-\pi^0$	$(3.1\ \pm1.0\ )\times10^{-4}$		5075	DESIG=6
$2\pi^+\pi^-K^-K^0_S$	$(1.1\ \pm0.5\ )\times10^{-4}$		5075	DESIG=7
$2\pi^+\pi^-K^-K^0_S2\pi^0$	$(7.7\ \pm3.2\ )\times10^{-4}$		5047	DESIG=8
$2\pi^+2\pi^-2\pi^0$	$(5.9\ \pm2.0\ )\times10^{-4}$		5104	DESIG=9
$2\pi^+2\pi^-K^+K^-$	$(10\ \pm4\ )\times10^{-5}$		5062	DESIG=10
$2\pi^+2\pi^-K^+K^-\pi^0$	$(5.5\ \pm1.8\ )\times10^{-4}$		5047	DESIG=11
$2\pi^+2\pi^-K^+K^-2\pi^0$	$(10\ \pm4\ )\times10^{-4}$		5030	DESIG=12
$3\pi^+2\pi^-K^-K^0_S\pi^0$	$(6.7\ \pm2.6\ )\times10^{-4}$		5029	DESIG=13
$3\pi^+3\pi^-$	$(1.2\ \pm0.4\ )\times10^{-4}$		5103	DESIG=14
$3\pi^+3\pi^-2\pi^0$	$(1.2\ \pm0.4\ )\times10^{-3}$		5081	DESIG=15
$3\pi^+3\pi^-K^+K^-$	$(2.0\ \pm0.8\ )\times10^{-4}$		5029	DESIG=16
$3\pi^+3\pi^-K^+K^-\pi^0$	$(6.1\ \pm2.2\ )\times10^{-4}$		5011	DESIG=17
$4\pi^+4\pi^-$	$(1.7\ \pm0.6\ )\times10^{-4}$		5080	DESIG=18
$4\pi^+4\pi^-2\pi^0$	$(1.9\ \pm0.7\ )\times10^{-3}$		5051	DESIG=19

$\chi_{b2}(2P)$ [h]

$I^G(J^{PC}) = 0^+(2^{++})$
J needs confirmation. NODE=M081

Mass $m = 102686.5 \pm 0.22 \pm 0.50$ MeV NODE=M081M;DTYPE=M;OUR EVAL; → UNCHECKED ←
$m_{\chi_{b2}(2P)} - m_{\chi_{b1}(2P)} = 13.5 \pm 0.6$ MeV NODE=M081M2;DTYPE=D

$\chi_{b2}(2P)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)	
$\omega\,\Upsilon(1S)$	$(1.10^{+0.34}_{-0.30})$ %		50904	NODE=M081215;DESIG=3
$\gamma\,\Upsilon(2S)$	(10.6 ± 2.6) %	S=2.0	50854	DESIG=2
$\gamma\,\Upsilon(1S)$	(7.0 ± 0.7) %		50907	DESIG=1
$\pi\pi\chi_{b2}(1P)$	$(5.1 \pm 0.9) \times 10^{-3}$		50864	DESIG=4
$D^0 X$	< 2.4 %	CL=90%	–	DESIG=5
$\pi^+\pi^- K^+ K^- \pi^0$	$< 1.1 \times 10^{-4}$	CL=90%	51338	DESIG=6
$2\pi^+\pi^- K^- K^0_S$	$< 9 \times 10^{-5}$	CL=90%	51338	DESIG=7
$2\pi^+\pi^- K^- K^0_S 2\pi^0$	$< 7 \times 10^{-4}$	CL=90%	51335	DESIG=8
$2\pi^+ 2\pi^- 2\pi^0$	$(3.9 \pm 1.6) \times 10^{-4}$		51341	DESIG=9
$2\pi^+ 2\pi^- K^+ K^-$	$(9 \pm 4) \times 10^{-5}$		51337	DESIG=10
$2\pi^+ 2\pi^- K^+ K^- \pi^0$	$(2.4 \pm 1.1) \times 10^{-4}$		51335	DESIG=11
$2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	$(4.7 \pm 2.3) \times 10^{-4}$		51334	DESIG=12
$3\pi^+ 2\pi^- K^- K^0_S \pi^0$	$< 4 \times 10^{-4}$	CL=90%	51333	DESIG=13
$3\pi^+ 3\pi^-$	$(9 \pm 4) \times 10^{-5}$		51341	DESIG=14
$3\pi^+ 3\pi^- 2\pi^0$	$(1.2 \pm 0.4) \times 10^{-3}$		51339	DESIG=15
$3\pi^+ 3\pi^- K^+ K^-$	$(1.4 \pm 0.7) \times 10^{-4}$		51333	DESIG=16
$3\pi^+ 3\pi^- K^+ K^- \pi^0$	$(4.2 \pm 1.7) \times 10^{-4}$		51332	DESIG=17
$4\pi^+ 4\pi^-$	$(9 \pm 5) \times 10^{-5}$		51339	DESIG=18
$4\pi^+ 4\pi^- 2\pi^0$	$(1.3 \pm 0.5) \times 10^{-3}$		51336	DESIG=19

$\Upsilon(3S)$

$I^G(J^{PC}) = 0^-(1^{--})$

NODE=M048

Mass $m = 10355.2 \pm 0.5$ MeV — NODE=M048M;DTYPE=M

$m_{\Upsilon(3S)} - m_{\Upsilon(2S)} = 331.50 \pm 0.13$ MeV — NODE=M048DM2;DTYPE=D

Full width $\Gamma = 20.32 \pm 1.85$ keV — NODE=M048W;DTYPE=G;OUR EVAL; → UNCHECKED ←

$\Gamma_{ee} = 0.443 \pm 0.008$ keV — NODE=M048W2;DTYPE=E;OUR EVAL; → UNCHECKED ←

$\Upsilon(3S)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)	
$\Upsilon(2S)$ anything	(10.6 ± 0.8) %		296	NODE=M048215;DESIG=8
$\Upsilon(2S)\pi^+\pi^-$	(2.82 ± 0.18) %	S=1.6	177	DESIG=4
$\Upsilon(2S)\pi^0\pi^0$	(1.85 ± 0.14) %		190	DESIG=10
$\Upsilon(2S)\gamma\gamma$	(5.0 ± 0.7) %		327	DESIG=12
$\Upsilon(2S)\pi^0$	$< 5.1 \times 10^{-4}$	CL=90%	298	DESIG=107
$\Upsilon(1S)\pi^+\pi^-$	(4.37 ± 0.08) %		813	DESIG=3
$\Upsilon(1S)\pi^0\pi^0$	(2.20 ± 0.13) %		816	DESIG=11
$\Upsilon(1S)\eta$	$< 1 \times 10^{-4}$	CL=90%	677	DESIG=9
$\Upsilon(1S)\pi^0$	$< 7 \times 10^{-5}$	CL=90%	846	DESIG=106
$h_b(1P)\pi^0$	$< 1.2 \times 10^{-3}$	CL=90%	426	DESIG=112
$h_b(1P)\pi^0 \to \gamma\eta_b(1S)\pi^0$	$(4.3 \pm 1.4) \times 10^{-4}$		–	DESIG=113
$h_b(1P)\pi^+\pi^-$	$< 1.2 \times 10^{-4}$	CL=90%	353	DESIG=114
$\tau^+\tau^-$	(2.29 ± 0.30) %		4863	DESIG=16
$\mu^+\mu^-$	(2.18 ± 0.21) %	S=2.1	5177	DESIG=1
e^+e^-	seen		5178	DESIG=2;OUR EVAL;→ UNCHECKED ←
ggg	(35.7 ± 2.6) %		–	DESIG=109
γgg	$(9.7 \pm 1.8) \times 10^{-3}$		–	DESIG=110
Radiative decays				NODE=M048;CLUMP=B
$\gamma\chi_{b2}(2P)$	(13.1 ± 1.6) %	S=3.4	†	DESIG=5
$\gamma\chi_{b1}(2P)$	(12.6 ± 1.2) %	S=2.4	99	DESIG=6
$\gamma\chi_{b0}(2P)$	(5.9 ± 0.6) %	S=1.4	122	DESIG=7
$\gamma\chi_{b2}(1P)$	$(9.9 \pm 1.3) \times 10^{-3}$	S=2.0	434	DESIG=103
$\gamma A^0 \to \gamma$ hadrons	$< 8 \times 10^{-5}$	CL=90%	–	DESIG=115
$\gamma\chi_{b1}(1P)$	$(9 \pm 5) \times 10^{-4}$	S=1.9	452	DESIG=104
$\gamma\chi_{b0}(1P)$	$(2.7 \pm 0.4) \times 10^{-3}$		484	DESIG=13
$\gamma\eta_b(2S)$	$< 6.2 \times 10^{-4}$	CL=90%	350	DESIG=14
$\gamma\eta_b(1S)$	$(5.1 \pm 0.7) \times 10^{-4}$		913	DESIG=15
$\gamma X \to \gamma + \geq 4$ prongs	[j] $< 2.2 \times 10^{-4}$	CL=95%	–	DESIG=102
$\gamma a_1^0 \to \gamma\mu^+\mu^-$	$< 5.5 \times 10^{-6}$	CL=90%	–	DESIG=116
$\gamma a_1^0 \to \gamma\tau^+\tau^-$	[k] $< 1.6 \times 10^{-4}$	CL=90%	–	DESIG=108

Lepton Family number (*LF*) violating modes NODE=M048;CLUMP=C

$e^{\pm}\tau^{\mp}$	*LF*	$<$ 4.2	$\times 10^{-6}$	CL=90%	5025	DESIG=111
$\mu^{\pm}\tau^{\mp}$	*LF*	$<$ 3.1	$\times 10^{-6}$	CL=90%	5025	DESIG=105

$\chi_b(3P)$

$I^G(J^{PC}) = ?^?(?^{?+})$

NODE=M206

Mass $m = 10534 \pm 9$ MeV NODE=M206M;DTYPE=M

$\chi_b(3P)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)	
$\Upsilon(1S)\gamma$	seen	1019	NODE=M206215;DESIG=1
$\Upsilon(2S)\gamma$	seen	498	DESIG=2

$\Upsilon(4S)$ or $\Upsilon(10580)$

$I^G(J^{PC}) = 0^-(1^{--})$

NODE=M047

Mass $m = 10579.4 \pm 1.2$ MeV NODE=M047M;DTYPE=M

Full width $\Gamma = 20.5 \pm 2.5$ MeV NODE=M047W;DTYPE=G

$\Gamma_{ee} = 0.272 \pm 0.029$ keV (S = 1.5) NODE=M047W1;DTYPE=E

$\Upsilon(4S)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)	
$B\overline{B}$	$>$ 96 %	95%	327	NODE=M047215;DESIG=8;OUR EST; → UNCHECKED ←
B^+B^-	(51.3 ±0.6) %		332	DESIG=10
D_s^+ anything + c.c.	(17.8 ±2.6) %		–	DESIG=12
$B^0\overline{B}^0$	(48.7 ±0.6) %		327	DESIG=11
$J/\psi K_S^0 (J/\psi,\ \eta_c) K_S^0$	$<$ 4 $\times 10^{-7}$	90%	–	DESIG=15
non-$B\overline{B}$	$<$ 4 %	95%	–	DESIG=6
e^+e^-	(1.57±0.08) $\times 10^{-5}$		5290	DESIG=1
$\rho^+\rho^-$	$<$ 5.7 $\times 10^{-6}$	90%	5233	DESIG=16
$J/\psi(1S)$ anything	$<$ 1.9 $\times 10^{-4}$	95%	–	DESIG=2
D^{*+} anything + c.c.	$<$ 7.4 %	90%	5099	DESIG=3
ϕ anything	(7.1 ±0.6) %		5240	DESIG=4
$\phi\eta$	$<$ 1.8 $\times 10^{-6}$	90%	5226	DESIG=13
$\phi\eta'$	$<$ 4.3 $\times 10^{-6}$	90%	5196	DESIG=18
$\rho\eta$	$<$ 1.3 $\times 10^{-6}$	90%	5247	DESIG=19
$\rho\eta'$	$<$ 2.5 $\times 10^{-6}$	90%	5217	DESIG=20
$\Upsilon(1S)$ anything	$<$ 4 $\times 10^{-3}$	90%	1053	DESIG=5
$\Upsilon(1S)\pi^+\pi^-$	(8.1 ±0.6) $\times 10^{-5}$		1026	DESIG=7
$\Upsilon(1S)\eta$	(1.96±0.11) $\times 10^{-4}$		924	DESIG=17
$\Upsilon(2S)\pi^+\pi^-$	(8.6 ±1.3) $\times 10^{-5}$		468	DESIG=9
$h_b(1P)\pi^+\pi^-$	not seen		600	DESIG=21
$\overline{d}$ anything	$<$ 1.3 $\times 10^{-5}$	90%	–	DESIG=14

$\Upsilon(10860)$

$I^G(J^{PC}) = 0^-(1^{--})$

NODE=M092

Mass $m = 10876 \pm 11$ MeV NODE=M092M;DTYPE=M;OUR EVAL; → UNCHECKED ←

Full width $\Gamma = 55 \pm 28$ MeV NODE=M092W;DTYPE=G;OUR EVAL; → UNCHECKED ←

$\Gamma_{ee} = 0.31 \pm 0.07$ keV (S = 1.3) NODE=M092W1;DTYPE=E

$\Upsilon(10860)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)	
$B\overline{B}X$	$(75.9\ ^{+2.7}_{-4.0})$ %		–	NODE=M092215;DESIG=9
$B\overline{B}$	(5.5 ± 1.0) %		1303	DESIG=2
$B\overline{B}^* +$ c.c.	(13.7 ± 1.6) %		–	DESIG=3
$B^*\overline{B}^*$	(38.1 ± 3.4) %		1102	DESIG=4
$B\overline{B}^{(*)}\pi$	< 19.7 %	90%	990	DESIG=10
$B\overline{B}\pi$	(0.0 ± 1.2) %		990	DESIG=23
$B^*\overline{B}\pi + B\overline{B}^*\pi$	(7.3 ± 2.3) %		–	DESIG=24
$B^*\overline{B}^*\pi$	(1.0 ± 1.4) %		701	DESIG=25
$B\overline{B}\pi\pi$	< 8.9 %	90%	504	DESIG=11
$B_s^{(*)}\overline{B}_s^{(*)}$	(19.9 ± 3.0) %		877	DESIG=16
$B_s\overline{B}_s$	$(5 \pm 5) \times 10^{-3}$		877	DESIG=5
$B_s\overline{B}_s^* +$ c.c.	(1.34 ± 0.32) %		–	DESIG=7
$B_s^*\overline{B}_s^*$	(17.5 ± 2.6) %		495	DESIG=8
no open-bottom	$(4.2\ ^{+5.0}_{-0.6})$ %		–	DESIG=28
e^+e^-	$(5.6 \pm 3.1) \times 10^{-6}$		5438	DESIG=1
$\Upsilon(1S)\pi^+\pi^-$	$(5.3 \pm 0.6) \times 10^{-3}$		1297	DESIG=17
$\Upsilon(2S)\pi^+\pi^-$	$(7.8 \pm 1.3) \times 10^{-3}$		774	DESIG=18
$\Upsilon(3S)\pi^+\pi^-$	$(4.8\ ^{+1.9}_{-1.7}) \times 10^{-3}$		429	DESIG=19
$\Upsilon(1S)K^+K^-$	$(6.1 \pm 1.8) \times 10^{-4}$		947	DESIG=20
$h_b(1P)\pi^+\pi^-$	$(3.5\ ^{+1.0}_{-1.3}) \times 10^{-3}$		894	DESIG=26
$h_b(2P)\pi^+\pi^-$	$(6.0\ ^{+2.1}_{-1.8}) \times 10^{-3}$		534	DESIG=27

Inclusive Decays. NODE=M092;CLUMP=I

These decay modes are submodes of one or more of the decay modes above. NODE=M092

ϕ anything	$(13.8\ ^{+2.4}_{-1.7})$ %		–	DESIG=12
D^0 anything + c.c.	(108 ± 8) %		–	DESIG=13
D_s anything + c.c.	(46 ± 6) %		–	DESIG=6
J/ψ anything	(2.06 ± 0.21) %		–	DESIG=14
B^0 anything + c.c.	(77 ± 8) %		–	DESIG=21
B^+ anything + c.c.	(72 ± 6) %		–	DESIG=22

$\Upsilon(11020)$

$I^G(J^{PC}) = 0^-(1^{--})$ NODE=M093

Mass $m = 11019 \pm 8$ MeV NODE=M093M;DTYPE=M

Full width $\Gamma = 79 \pm 16$ MeV NODE=M093W;DTYPE=G

$\Gamma_{ee} = 0.130 \pm 0.030$ keV NODE=M093W1;DTYPE=E

$\Upsilon(11020)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)	
e^+e^-	$(1.6 \pm 0.5) \times 10^{-6}$	5510	NODE=M093215;DESIG=1

NOTES

[a] $2m_\tau < \mathrm{M}(\tau^+\tau^-) < 7500$ MeV LINKAGE=E49

[b] $2 < m_{K^+K^-} < 3$ GeV LINKAGE=G49

[c] X = scalar with $m < 8.0$ GeV LINKAGE=A49

[d] $X\overline{X}$ = vectors with $m < 3.1$ GeV LINKAGE=B49

[e] X and $\overline{X}$ = zero spin with $m < 4.5$ GeV LINKAGE=F49

[f] 1.5 GeV $< m_X <$ 5.0 GeV LINKAGE=C49

[g] $201 < \mathrm{M}(\mu^+\mu^-) < 3565$ MeV LINKAGE=D49

[h] Spectroscopic labeling for these states is theoretical, pending experimental information. LINKAGE=MJ

[i] 1.5 GeV $< m_X <$ 5.0 GeV LINKAGE=C52

[j] 1.5 GeV $< m_X <$ 5.0 GeV LINKAGE=C48

[k] For $m_{\tau^+\tau^-}$ in the ranges 4.03–9.52 and 9.61–10.10 GeV. LINKAGE=MRG